Summary of Contents

Additionally, we used a variety of satellite datasets for the UESI, especially to calculate the physical characteristics of the cities at the neighborhood scale, namely albedo, Normalized Difference Vegetation Index (NDVI), Normalized Difference Built-up Index (NDBI), and elevation. These datasets are further described in the tab 'Satellite products.'

Indicator: $PM_{2.5}$ Average Exposure

Code: PM2.5

Objective / Issue Category: Air Pollution

What it Measures: Air Pollution - Average Exposure to $PM_{2.5}$ (fine particulate matter in micrograms per cubic meter ($\mu g/m^3$).

Rationale for Inclusion: Suspended particulates contribute to acute lower respiratory infections and other diseases such as cancer. Fine particulates or $PM_{2.5}$ (particulates with a diameter of 2.5 microns and smaller) lodge deep in lung tissue and are far more injurious to health than coarser particulates. Average annual concentrations of greater than 10 micrograms per cubic meter are known to be injurious to human health.

INDICATOR CREATION

Unit of Measurement: Population weighted exposure to $PM_{2.5}$ in micrograms per cubic meter
Method / Description: These data were derived from a model that was parameterized by data on Aerosol Optical Depth (AOD) from NASA's MODIS, SeaWiFS, and MISR satellite instruments, and the GEOS-Chem chemical transport model. The model covered all areas south of 70-degree north Latitude and north of 70-degree south latitude. van Donkelaar et al. estimated annual global surface PM2.5 concentrations at a 1 x 1 km spatial resolution.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark: 10 micrograms/m^3 Low Performance Benchmark: 95th percentile (42.5 micrograms/m^3)
Target Source: N/A
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: van Donkelaar, et al. (2016) "Global Estimates of Fine Particulate Matter using a Combined Geophysical-Statistical Method with Information from Satellites, Models, and Monitors," Environmental Science & Technology, 50(7): 3762-3772.
Variable / Units: $\mu g/m^3$
Method: These data were derived from a model that was parameterized by data on Aerosol Optical Depth (AOD) from NASA's MODIS, SeaWiFS, and MISR satellite instruments, and the GEOS-Chem chemical transport model. The model covered all areas south of 70-degree north Latitude and north of 70-degree south latitude. van Donkelaar et al. estimated annual global surface PM2.5 concentrations at a 10 x 10 km

spatial resolution, and then created three year moving averages from 2000 to 2014. Population-weighted average exposure values were calculated using population data from the Global Rural Urban Mapping Project (2011) database.
Year of Publication: 2017
Covered Time: 2000-2016
URL: https://pubs.acs.org/doi/abs/10.1021/acs.est.5b05833
Date Data Obtained: 2017
Data Type: Gridded

Indicator: Air - $PM_{2.5}$ Exceedance

Code: PM25EXBL

Objective / Issue Category: Air Quality

What it Measures: Average percentage of the population whose exposure to $PM_{2.5}$ is above the interim health targets of 10, 15, 25, and 35 $\mu g/m^3$.

Rationale for Inclusion: Rationale for Inclusion: Suspended particulates contribute to acute lower respiratory infections and other diseases such as cancer. Fine particulates or $PM_{2.5}$ (particulates with a diameter of 2.5 microns and smaller) lodge deep in lung tissue and are far more injurious to health than coarser particulates. Average annual concentrations of greater than 10 micrograms per cubic meter are known to be injurious to human health. The World Health Organization has also set three interim health targets of 15, 25 and 35 ($\mu g/m^3$).

INDICATOR CREATION

Unit of Measurement: Population weighted exposure to $PM_{2.5}$ in micro-grams per cubic meter
Method / Description: These data were derived from a model that was parameterized by data on Aerosol Optical Depth (AOD) from NASA's MODIS, SeaWiFS, and MISR satellite instruments, and the GEOS-Chem chemical transport model. The model covered all areas south of 70-degree north Latitude and north of 70-degree south latitude. van Donkelaar et al. estimated annual global surface $PM_{2.5}$ concentrations at a 1 x 1 km spatial resolution.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: High performance benchmark: 0 Low performance benchmark: 99th percentile (100 percent), proportion of the population exposed to $PM_{2.5}$ thresholds
Target Source: N/A
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: van Donkelaar, et al. (2016) "Global Estimates of Fine Particulate Matter using a Combined Geophysical-Statistical Method with Information from Satellites, Models, and Monitors," Environmental Science & Technology, 50(7): 3762-3772.
Variable / Units: µg/m3
Method: These data were derived from a model that was parameterized by data on Aerosol Optical Depth (AOD) from NASA's MODIS, SeaWiFS, and MISR satellite

instruments, and the GEOS-Chem chemical transport model. The model covered all areas south of 70-degree north Latitude and north of 70-degree south latitude. van Donkelaar et al. estimated annual global surface PM2.5 concentrations at a 1 x 1 km spatial resolution, and then created three year moving averages from 2000 to 2016. Population-weighted average exposure values were calculated using population data from the Global Rural Urban Mapping Project (2017) database.
Year of Publication: 2017
Covered Time: 2000-2016
URL: https://pubs.acs.org/doi/abs/10.1021/acs.est.5b05833
Date Data Obtained: 6/1/17
Data Type: Gridded

Source (2) Citation: Center for International Earth Science Information Network - CIESIN - Columbia University. 2017. Gridded Population of the World, Version 4 (GPWv4): Population Density, Revision 10. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/H4DZ068D. Accessed 12/8/2017
Variable / Units: Human population density (number of persons per square kilometer)
Method: N/A
Year of Publication: 2017
Covered Time: 2000, 2005, 2010, 2015, 2020 (2015 data used in UESI)
URL: https://doi.org/10.7927/H4DZ068D
Date Data Obtained: 12/08/2017
Data Type: Geospatial

Indicator: NO_2

Code: NO2

Objective / Issue Category: Air Quality

What it Measures: Average exposure to NO_2

Rationale for Inclusion: The result of fossil fuel combustion, nitrogen dioxide can irritate the lungs and lower resistance to respiratory infections such as influenza. Nitrogen oxides contribute to ozone formation, which is also known to contribute to smog and human health impacts.

INDICATOR CREATION

Unit of Measurement: Average exposure, in ppb
Method / Description: The authors used observations of NO_2 tropospheric column densities from three satellite instruments in combination with chemical transport modeling to produce a global 17-year record of ground-level NO_2 at 0.1° x 0.1° resolution. We calculated linear trends in population-weighted annual mean NO_2 (PWMNO2) concentrations in different regions around the world as defined by the Global Burden of Disease Study.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark: 0 Low Performance Benchmark: 11.3 (99th percentile)
Target Source: N/A
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: Geddes, J. A., Martin, R. V., Boys, B. L., & van Donkelaar, A. (2015). Long-term trends worldwide in ambient NO_2 concentrations inferred from satellite observations. Environmental health perspectives, 124(3), 281-289.
Variable / Units: average exposure, in ppb
Method: The authors used observations of NO_2 tropospheric column densities from three satellite instruments in combination with chemical transport modeling to produce a global 17-year record of ground-level NO_2 at 0.1° x 0.1° resolution. We calculated linear trends in population-weighted annual mean NO_2 (PWMNO2) concentrations in different regions around the world as defined by the Global Burden of Disease Study.
Year of Publication: 2015

Covered Time: N/A
URL: http://ehp.niehs.nih.gov/1409567/
Date Data Obtained: N/A
Data Type: Gridded

Indicator: UHI intensity

Code: UHI and UHINIGHT

Objective / Issue Category: Climate

What it Measures: Daytime and nighttime urban heat island intensity

Rationale for Inclusion: Urban areas are warmer than their surroundings, known as the urban heat island (UHI) effect. This increases heat stress in urban areas, adds to the impact of global climate change, enhances heat waves, increases electricity consumption, and also leads to enhanced production of secondary air pollutants. Therefore, the UHI negatively affects human health and is an important adverse consequence of urbanization.

INDICATOR CREATION (UHI)

Unit of Measurement: Kelvin
Method / Description: These data were created using the simplified urban-extent (SUE) algorithm previously used to create a global map of UHI. The SUE algorithm was modified for the UESI to work at the neighborhood scale. The algorithm was implemented on the MODIS Land use/Land cover dataset and the MODIS daytime Land Surface Temperature (LST) data detected during the AQUA overpass time (1:30 pm local time).
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark: 0 Low Performance Benchmark: negative (no exact value)
Target Source: N/A
Target Citation: N/A

INDICATOR CREATION (UHINIGHT)

Unit of Measurement: Kelvin
Method / Description: These data were created using the simplified urban-extent (SUE) algorithm previously used to create a global map of UHI. The SUE algorithm was modified for the UESI to work at the neighborhood scale. The algorithm was implemented on the MODIS Land use/Land cover dataset and the MODIS nighttime Land Surface Temperature (LST) data detected during the AQUA overpass time (1:30 am local time).
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target:

N/A (ideally 0)
Target Source: N/A
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: T. Chakraborty & X. Lee, (2019) "A simplified urban-extent algorithm to characterize surface urban heat islands on a global scale and examine vegetation control on their spatiotemporal variability", International Journal of Applied Earth Observation and Geoinformation. 74, 269-280, 2019. doi: https://doi.org/10.1016/j.jag.2018.09.015"
Variable / Units: Kelvin
Method: The SUE algorithm estimates the UHI of an urban cluster by finding the difference between the LST of the urban pixels and the LST of the non-water pixels without explicitly defining buffers around the urban area. The algorithm was modified for the UESI such that the rural reference was same for all the neighborhoods and based on the non-urban, non-water pixels within the entire urban shapefile, while the urban LST of a neighborhood was computed using all the pixels of the neighborhood. Finally, those neighborhoods with no pixels (due to extremely small size) were removed from the analysis.
Year of Publication: forthcoming, 2019
Covered Time: 2003-2017
URL: https://doi.org/10.1016/j.jag.2018.09.015
Date Data Obtained: 2018
Data Type: Gridded

Indicator: Climate Policy

Code: CLIMPOL

Objective / Issue Category: Climate

What it Measures: It measures a city's number of climate policies, under four broad categories: emission reduction timeline and goal, sectoral mitigation policy, adaptation policy, and transparency and finance

Rationale for Inclusion: The Climate Policy Indicator measures cities' policies and actions to mitigate and adapt to the effects of climate change. The indicator can be analyzed alongside the outcome indicators such as tree loss and air pollution, to allow us to explore correlating or even causal relationships between policy and environmental effects.

INDICATOR CREATION

Unit of Measurement: This indicator uses a point-based scoring system
Method / Description: Climate mitigation and adaptation policies are extracted from the global climate actions database (which covers Carbonn Climate Registry, Covenant of Mayors, NAZCA2016, C40 Cities, Compact of Mayors, Under2Coalition, Climate Mayors and Climate Alliance) and downloaded from UESI cities' official websites. They are then scored using a checklist that covers different dimensions of mitigation and adaptation policies. Cities' climate policies in each category are scored only once. A detailed rubric can be found on the Climate Change Issue Profile.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark: 47 (maximum points) Low Performance Benchmark: 0
Target Source: UESI Authors
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: City of Barcelona. (n.d.). Barcelona's Commitment to the Climate. Retrieved from: http://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/Barcelona%20Commitement%20to%20Climate.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: N/A
Covered Time: N/A

URL: http://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/Barcelona%20C ommitement%20to%20Climate.pdf
Date Data Obtained: N/A
Data Type: PDF

Source (2) Citation: City of Buenos Aires. (2015). Buenos Aires Climate Change Action Plan English Summary. Retrieved from: https://www.bbhub.io/mayors/sites/14/2015/09/Plan-de-accion-resumen-en-ingles.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: 2015
Covered Time: N/A
URL: https://www.bbhub.io/mayors/sites/14/2015/09/Plan-de-accion-resumen-en-ingles.pdf.
Date Data Obtained: 9/15/ 2018
Data Type: PDF

Source (3) Citation: City of Lima. (2015). Climate change adaptation and mitigation strategy for the province of Lima. Retrieved from: https://pruebafuerzasocial.files.wordpress.com/2015/05/estrategia-de-adaptacic3b3n-y-mitigacic3b3n-de-la-provincia-de-lima-al-cambio-climc3a1tico.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: 2015
Covered Time: N/A
URL: https://pruebafuerzasocial.files.wordpress.com/2015/05/estrategia-de-adaptacic3b3n-y-mitigacic3b3n-de-la-provincia-de-lima-al-cambio-climc3a1tico.pdf
Date Data Obtained: 9/1/ 2018
Data Type: PDF

Source (4) Citation: City of Amsterdam. (2015). Sustainable Amsterdam: Agenda for renewable energy, clear air, a circular economy and a climate-resilient city. Retrieved from: https://assets.amsterdam.nl/publish/pages/675721/samenvatting_a5_agenda_duurzaamheid_eng.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: 2015
Covered Time: N/A

URL: https://assets.amsterdam.nl/publish/pages/675721/samenvatting_a5_agenda_duurzaamheid_eng.pdf
Date Data Obtained: N/A
Data Type: PDF

Source (5) Citation: 100 Resilient Cities. (2017). Resilient Bangkok. Rockefeller Foundation. Retrieved from: http://www.100resilientcities.org/wp-content/uploads/2017/07/Bangkok_-_Resilience_Strategy.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: 2017
Covered Time: N/A
URL: http://www.100resilientcities.org/wp-content/uploads/2017/07/Bangkok_-_Resilience_Strategy.pdf
Date Data Obtained: N/A
Data Type: PDF

Source (6) Citation: City of Bangkok. (2015). Executive Summary: The Bangkok Master Plan on Climate Change 2013-2023. Retrieved from: http://203.155.220.174/uploads/File/JICA_ENG_V.11--ok%20(5).pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: 2015
Covered Time: N/A
URL: http://203.155.220.174/uploads/File/JICA_ENG_V.11--ok%20(5).pdf
Date Data Obtained: N/A
Data Type: PDF

Source (7) Citation: City of Boston. (2014). Greenovate Boston: 2014 Climate Action Plan Update. Retrieved from: https://www.boston.gov/sites/default/files/greenovate_boston_2014_cap_update.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2014
Covered Time: N/A
URL: https://www.boston.gov/sites/default/files/greenovate_boston_2014_cap_update.pdf

Date Data Obtained: 2017
Data Type: PDF

Source (8) Citation: City of Copenhagen. (2016). CPH 2025 Climate Plan: Roadmap 2017–2020. Retrieved from: http://kk.sites.itera.dk/apps/kk_pub2/pdf/1586_0kE7bzR28V.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2016
Covered Time: N/A
URL: http://kk.sites.itera.dk/apps/kk_pub2/pdf/1586_0kE7bzR28V.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (9) Citation: City of Melbourne. (2017). Climate Change Adaptation Strategy Refresh 2017. Retrieved from: https://www.melbourne.vic.gov.au/sitecollectiondocuments/climate-change-adaptation-strategy-refresh-2017.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2017
Covered Time: N/A
URL: https://www.melbourne.vic.gov.au/sitecollectiondocuments/climate-change-adaptation-strategy-refresh-2017.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (10) Citation: City of Melbourne. (2014). Zero Net Emissions By 2020: a collaborative approach to the next four years of action update 2014. Retrieved from: https://www.melbourne.vic.gov.au/SiteCollectionDocuments/zero-net-emissions-update-2014.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2014
Covered Time: N/A
URL: https://www.melbourne.vic.gov.au/SiteCollectionDocuments/zero-net-emissions-update-2014.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (11) Citation: City of Melbourne. 16 August 2016. Emissions Reduction Plan for Council operations 2016 - 2021: Report to the Future Melbourne (Environment) Committee. Retrieved from: https://www.melbourne.vic.gov.au/about-council/committees-meetings/meeting-archive/meetingagendaitemattachments/750/13469/aug16%20fmc2%20agenda%20item%206.6.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2016
Covered Time: N/A
URL: https://www.melbourne.vic.gov.au/about-council/committees-meetings/meeting-archive/meetingagendaitemattachments/750/13469/aug16%20fmc2%20agenda%20item%206.6.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (12) Citation: City of Melbourne. 9 November 2016. National Carbon Offset Standard Carbon Neutral Program. Retrieved from: https://www.melbourne.vic.gov.au/SiteCollectionDocuments/2015-16-public-disclosure-summary.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2016
Covered Time: N/A
URL: https://www.melbourne.vic.gov.au/SiteCollectionDocuments/2015-16-public-disclosure-summary.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (13) Citation: City of Atlanta Mayor's Office of Sustainability. Jul 23, 2015. City of Atlanta Climate Action Plan. Retrieved from: https://atlantaclimateactionplan.files.wordpress.com/2016/02/atlanta-climate-action-plan-07-23-2015.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2015
Covered Time: N/A
URL: https://atlantaclimateactionplan.files.wordpress.com/2016/02/atlanta-

climate-action-plan-07-23-2015.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (14) Citation: Detroiter's Working for Environmental Justice. (2017). Detroit Climate Action Plan. Retrieved from: https://detroitenvironmentaljustice.org/wp-content/uploads/2017/11/CAP_WEB.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2017
Covered Time: N/A
URL: https://detroitenvironmentaljustice.org/wp-content/uploads/2017/11/CAP_WEB.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (15) Citation: What is the Chicago Climate Action Plan? Retrieved from http://www.chicagoclimateaction.org/. Accessed 2017.
Variable / Units: N/A
Method: N/A
Year of Publication: N/A
Covered Time: N/A
URL: http://www.chicagoclimateaction.org/
Date Data Obtained: 2017
Data Type: Website

Source (16) Citation: Beijing Municipal People's Government. (2017). Notice of the Beijing Municipal People's Government on Printing and Distributing the Plan for Energy Conservation and Consumption Reduction and Climate Change in Beijing during the Thirteenth Five-Year Plan Period.
Variable / Units: N/A
Method: N/A
Year of Publication: 2017
Covered Time: N/A
URL: http://zfxxgk.beijing.gov.cn/110001/szfwj/2016-08/07/content_c7607556c0e74fe58c1c85a5d25183b6.shtml
Date Data Obtained: 2018
Data Type: Website

Source (17) Citation: Berlinbuilds. May 2016. Climate-Neutral Berlin 2050: Recommendations for a Berlin Energy and Climate Protection Programme (BEK). Retrieved from: https://www.berlin.de/senuvk/klimaschutz/bek_berlin/download/Broschuere_BEK_EN.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2016
Covered Time: N/A
URL: https://www.berlin.de/senuvk/klimaschutz/bek_berlin/download/Broschuere_BEK_EN.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (18) Citation: Jakarta: Climate Change Adaptation. Accessed from http://deltacities.com/cities/jakarta/climate-change-adaptation. Accessed 2017.
Variable / Units: N/A
Method: N/A
Year of Publication: N/A
Covered Time: N/A
URL: http://deltacities.com/cities/jakarta/climate-change-adaptation
Date Data Obtained: 2017
Data Type: Website

Source (19) Citation: Jakarta Environment Management Board. (2011). Measurements in Climate Change in Jakarta. Retrieved from: https://citynet-ap.org/wp-content/uploads/2011/12/CLIMATE_CHANGE_MEASURES-Dhaka_27_November_2011.pdf
Variable / Units: N/A
Method: N/A
Year of Publication: 2011
Covered Time: N/A
URL: https://citynet-ap.org/wp-content/uploads/2011/12/CLIMATE_CHANGE_MEASURES-Dhaka_27_November_2011.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (20) Citation: http://climateaction.unfccc.int/city/jakarta/indonesia. Accessed 2017.
Variable / Units: N/A
Method: N/A
Year of Publication: N/A
Covered Time: N/A
URL: http://climateaction.unfccc.int/city/jakarta/indonesia
Date Data Obtained: 2017
Data Type: Website

Source (21) Citation: C40 Cities Case Study: Jakarta - Alleviating Floods with Parks for Children. September 14, 2017. Retrieved from https://www.c40.org/case_studies/cities100-jakarta-alleviating-floods-with-parks-for-children. Accessed: 2017.
Variable / Units: N/A
Method: N/A
Year of Publication: 2017
Covered Time: N/A
URL: https://www.c40.org/case_studies/cities100-jakarta-alleviating-floods-with-parks-for-children
Date Data Obtained: 2017
Data Type: Website

Source (22) Citation: C40 Cities Case Study: Jakarta - Coastal Defense Strategy and Flood Mapping. February 15, 2016. Retrieved from https://www.c40.org/case_studies/c40-good-practice-guides-jakarta-coastal-defence-strategy-and-flood-mapping. Accessed: 2017.
Variable / Units: N/A
Method: N/A
Year of Publication: 2016
Covered Time: N/A
URL: https://www.c40.org/case_studies/c40-good-practice-guides-jakarta-coastal-defence-strategy-and-flood-mapping
Date Data Obtained: 2017
Data Type: Website

Source (23) Citation: City of Johannesburg. Greenhouse Gas Emissions Inventory For the City of Johannesburg. Retrieved from: https://carbonn.org/uploads/tx_carbonndata/GPC%20Report%20for%20the%20City%20of%20Johannesburg_01.pdf

Variable / Units: N/A
Method: N/A
Year of Publication: N/A
Covered Time: N/A
URL: https://carbonn.org/uploads/tx_carbonndata/GPC%20Report%20for%20the%20City%20of%20Johannesburg_01.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (24) Citation: Mayor of London. March 2016. London Plan Chapter Five: London's Response To Climate Change. Accessed 2017.
Variable / Units: N/A
Method: N/A
Year of Publication: 2016
Covered Time: N/A
URL: https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan/london-plan-chapter-five-londons-response
Date Data Obtained: 2017
Data Type: Website

Source (25) Citation: City of Los Angeles. (2015). Sustainability City Plan. Retrieved from: https://www.dropbox.com/s/e768n31r3k379w7/the-plan.pdf?dl=0.
Variable / Units: N/A
Method: N/A
Year of Publication: 2015
Covered Time: N/A
URL: https://www.dropbox.com/s/e768n31r3k379w7/the-plan.pdf?dl=0
Date Data Obtained: 2017
Data Type: PDF

Source (26) Citation: Data-Driven Yale Database of Climate Action Commitments. (2018). Draws on climate action commitments made through CDP, Global Covenant of Mayors for Climate and Energy, Global Covenant of Mayors (EU Secretariat), States and Regions Annual disclosure to CDP, in partnership with The Climate Group, ICLEI Carbonn Climate Registry, C40 Cities Climate Leadership Group, Under2 Coalition (Secretariat The Climate Group), and the United States Climate Alliance.
Variable / Units: N/A
Method: N/A

Year of Publication: 2018
Covered Time: N/A
URL: N/A
Date Data Obtained: 2015-2017
Data Type: Database

Source (27) Citation: Sustainable Montreal 2016-2020. Retrieved from: http://ville.montreal.qc.ca/pls/portal/docs/page/d_durable_en/media/documents/plan_de_dd_en_lr.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: N/A
Covered Time: N/A
URL: http://ville.montreal.qc.ca/pls/portal/docs/page/d_durable_en/media/documents/plan_de_dd_en_lr.pdf
Date Data Obtained: 2017-2018
Data Type: PDF

Source (28) Citation: New York City Mayor's Office of Sustainability. (2017). Aligning New York City with the Paris Climate Agreement. Retrieved from: https://www1.nyc.gov/assets/sustainability/downloads/pdf/1point5-AligningNYCwithParisAgrmt%20(1).pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: September 2017
Covered Time: N/A
URL: https://www1.nyc.gov/assets/sustainability/downloads/pdf/1point5-AligningNYCwithParisAgrmt%20(1).pdf
Date Data Obtained: 2017
Data Type: PDF

Source (29) Citation: Mairie de Paris. Paris Climate and Energy Action Plan: 2012 Update. Retrieved from: https://api-site-cdn.paris.fr/images/70923.
Variable / Units: N/A
Method: N/A
Year of Publication: 2012
Covered Time: N/A
URL: https://api-site-cdn.paris.fr/images/70923

Date Data Obtained: 2017/2018
Data Type: PDF

Source (30) Citation: The Municipal Committee on Climate Change and Economy and the Working Groups for Transportation, Energy, Construction, Land Use, Solid Waste and Health. (May 2011). Guidelines for the Action Plan of the City of Sao Paulo for Mitigation and Adaptation to Climate Change. Retrieved from: https://c40-production-images.s3.amazonaws.com/case_studies/images/83_SAO_20PAULO_20ACTION_20PLAN_20FOR_20MITIGATION_20AND_20ADAPTATION_20TO_20CLIMATE_20CHANGE.original.pdf?1389916718.
Variable / Units: N/A
Method: N/A
Year of Publication: 2011
Covered Time: N/A
URL: https://c40-production-images.s3.amazonaws.com/case_studies/images/83_SAO_20PAULO_20ACTION_20PLAN_20FOR_20MITIGATION_20AND_20ADAPTATION_20TO_20CLIMATE_20CHANGE.original.pdf?1389916718
Date Data Obtained: 2017
Data Type: PDF

Source (31) Citation: Seoul Metropolitan Government (Climate and Environment Headquarters). (November 2015). Action Plans for Promise of Seoul: Taking Actions Against Climate Change. Retrieved from: http://www.globalcovenantofmayors.org/wp-content/uploads/2015/06/1-1-Summary-of-Action-Plans-to-implement-Promise-of-Seoul_EN-1.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: 2015
Covered Time: N/A
URL: http://www.globalcovenantofmayors.org/wp-content/uploads/2015/06/1-1-Summary-of-Action-Plans-to-implement-Promise-of-Seoul_EN-1.pdf
Date Data Obtained: 2017-2018
Data Type: PDF

Source (32) Citation: Tokyo Metropolitan Government. (2007). Tokyo Climate Change Strategy: A Basic Policy for the 10-Year Project for a Carbon-Minus Tokyo. Tokyo Metropolitan Government. Retrieved from: https://www.kankyo.metro.tokyo.jp/climate/attachement/tokyo-climate-

changestrategy_2007.6.1.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: 2007
Covered Time: N/A
URL: https://www.kankyo.metro.tokyo.jp/climate/attachement/tokyo-climate-changestrategy_2007.6.1.pdf
Date Data Obtained: 2017
Data Type: N/A

Source (33) Citation: Tokyo Metropolitan Government. (2010). Tokyo Climate Change Strategy: Progress Report and Future Vision. Tokyo Metropolitan Government. Retrieved from: https://www.kankyo.metro.tokyo.jp/en/attachement/tokyo_climate_change_strategy_progress_report_03312010.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: 2010
Covered Time: N/A
URL: https://www.kankyo.metro.tokyo.jp/en/attachement/tokyo_climate_change_strategy_progress_report_03312010.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (34) Citation: Tokyo Metropolitan Government. Retrieved from: http://www.metro.tokyo.jp/ENGLISH/ABOUT/ENVIRONMENTAL_POLICY/FILES/04_2030_Goals.pdf.
Variable / Units: N/A
Method: N/A
Year of Publication: N/A
Covered Time: N/A
URL: http://www.metro.tokyo.jp/ENGLISH/ABOUT/ENVIRONMENTAL_POLICY/FILES/04_2030_Goals.pdf
Date Data Obtained: 2017
Data Type: PDF

Source (35) Citation: City of Vancouver. (2018). Greenest City Goals. Retrieved from: https://vancouver.ca/green-vancouver/greenest-city-goals-targets.aspx.

Variable / Units: N/A
Method: N/A
Year of Publication: 2017
Covered Time: N/A
URL: https://vancouver.ca/green-vancouver/greenest-city-goals-targets.aspx
Date Data Obtained: 2017-2018
Data Type: Web content

Source (36) Citation: City of Vancouver. (2012). Climate Change Adaptation Strategy. Retrieved from: https://vancouver.ca/green-vancouver/climate-change-adaptation-strategy.aspx.
Variable / Units: N/A
Method: N/A
Year of Publication: 2012
Covered Time: N/A
URL: https://vancouver.ca/green-vancouver/climate-change-adaptation-strategy.aspx
Date Data Obtained: 2017
Data Type: Web content

Indicator: Urban Water stress

Code: WATSTRESS

Objective / Issue Category: Water resources

What it Measures: Water stress measures the annual ratio of surface water withdrawn, relative to the total annual natural availability of surface water available, in key sub basins of interest.

Rationale for Inclusion: Water stress reflects a city's vulnerability to drought, pollution events, and other shocks or threats to water availability.

INDICATOR CREATION

Unit of Measurement: Annual water withdrawal relative to water availability
Method / Description: For each grid cell on the Earth's surface, information from the Water GAP model calculates the ratio of water withdrawals upstream to the surface water available at that grid cell.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark (raw data): Below 0.4 ratio of annual surface water use: annual surface water availability. Low Performance Benchmark: Above 0.4 ratio of annual surface water use: annual surface water availability.
Target Source: McDonald, R. I., Weber, K., Padowski, J., Flörke, M., Schneider, C., Green, P. A., ... & Boucher, T. (2014). Water on an urban planet: Urbanization and the reach of urban water infrastructure. Global Environmental Change, 27, 96-105.
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: McDonald, R.I. and D. Shemie, Urban Water Blueprint: Mapping conservation solutions to the global water challenge. 2016, The Nature Conservancy: Washington, D.C. (Updated data for 2016; report originally published in 2014)
Variable / Units: Ratio of surface water use/available surface water per year
Method: For each grid cell on the Earth's surface, information from the Water GAP model calculates the ratio of water withdrawals upstream to the surface water available at that grid cell.
Year of Publication: Published in 2014; interactive display updated in 2016 (2016 data shared by TNC)
Covered Time: Annual data (2016).
URL: http://water.nature.org/waterblueprint/#/section=overview&c=3:6.40265:-

37.17773
Date Data Obtained: 11/27/17
Data Type: Tabular

Indicator: Wastewater Treatment

Code: WATTREAT

Objective / Issue Category: Water Resources

What it Measures: The percentage of collected, generated, or produced wastewater that is treated.

Rationale for Inclusion: Wastewater can contain a variety of contaminants that are detrimental to both human and ecosystem health. Wastewater treatment is a measure of what percentage of wastewater is treated before it is released back into ecosystems.

INDICATOR CREATION

Unit of Measurement: Percentage of urban wastewater that receives treatment.
Method / Description: Given the heterogenous nature of available data, we employed a data ladder. We strove to find the most recent, city-specific data possible, regarding the percentage of collected, generated, or produced wastewater that is treated, and the percentage of the urban population connected to centralized wastewater treatment facilities. If city-specific data was unavailable, we used proxies, such as county-level or national urban data. To calculate a city's level of wastewater treatment, we typically multiplied the percentage of collected municipal wastewater receiving treatment with the percentage of the urban population with access to centralized wastewater treatment facilities. In some cases, when different forms of data were available, we determined the total amount of urban water waste treated, relative to all of the wastewater generated by a city.
Additional Notes: This data should be viewed with an awareness that these different data and forms of data make direct comparisons between cities difficult. This indicator is best used to assess an individual city's overall level of progress in collecting and treating wastewater, rather than to closely compare performance between cities.
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark (raw data): 100 Low Performance Benchmark (raw data): 0
Target Source: Expert opinion
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: FAO. 2017. AQUASTAT Main Database, Food and Agriculture Organization of the United Nations (FAO).
Variable / Units: Produced municipal wastewater (10^9 m3/year); collected municipal wastewater (10^9 m3/year); treated municipal wastewater (10^9 m3/year)
Method: Calculated ratio of treated/produced municipal water. For some cities, other data sources on municipal sewerage connection rates (% sewerage connection) was multiplied by the ratio treated/collected wastewater.
Year of Publication: 2016
Covered Time: 1985 - 2016 (year of data availability varies by city; most recent year of data was used in calculations)
URL: http://www.fao.org/nr/water/aquastat/data/query/results.html?regionQuery=true&yearGrouping=SURVEY&showCodes=false&yearRange.fromYear=1958&yearRange.toYear=2017&varGrpIds=4265%2C4269%2C4270%2C4493&cntIds=&regIds=9805%2C9806%2C9807%2C9808%2C9809&edit=0&save=0&query_type=WasteWpage&lowBandwidth=1&newestOnly=true&_newestOnly=on&showValueYears=true&_showValueYears=on&categoryIds=-1&_categoryIds=1&XAxis=VARIABLE&showSymbols=true&_showSymbols=on&_hideEmptyRowsColoumns=on&lang=en
Date Data Obtained: December 2017
Data Type: Tabular

Source (2) Citation: Organisation for Economic Cooperating and Development (OECD). (2014). Water Governance in Cities - City Profiles. Retrieved March 2018 from: http://www.oecd.org/cfe/regional-policy/water-governance-in-cities-city-profiles.htm.
Variable / Units: Reported city values for "share of wastewater treated," defined as the "percentage of wastewater produced by the city that is collected and treated to at least a basic/primary level."
Method: Adopted reported city values for "share of wastewater treated."
Year of Publication: 2014
Covered Time: City survey data collected in 2014
URL: http://www.oecd.org/cfe/regional-policy/cities-and-water-governance.htm; http://www.oecd.org/cfe/regional-policy/water-governance-in-cities-questionnaire.pdf
Date Data Obtained: December 2017
Data Type: Tabular

Source (3) Citation: World Council on City Data. WWCD ISO 37120. Retrieved November 2018 from: https://www.dataforcities.org/.
Variable / Units: Percentage of city population served by wastewater collection (core). Percentage of city's wastewater receiving primary treatment (core).
Method: N/A
Year of Publication:
Covered Time: Varies by city (typically 2015-2016)
URL: https://www.dataforcities.org/
Date Data Obtained: November 2018
Data Type: Website

Source (4) Citation: Percent of housing units lacking complete plumbing facilities. 2008-2012 American Community Survey 5-Year Estimates. (Accessed via interactive visualization: Ingraham, C. (23 April 2014). Living Without Indoor Plumbing. The Washington Post. Retrieved November 2018 from: http://www.washingtonpost.com/wp-srv/special/national/county-plumbing-facilities/index.html.)
Variable / Units: Percentage of occupied housing units lacking complete plumbing facilities (within US counties).
Method: Subtrack percentage of occupied housing units lacking complete public facilities from 100 to assess rates of sewerage coverage in counties containing UESI cities.
Year of Publication: 2014
Covered Time: 2008-2012
URL: http://www.washingtonpost.com/wp-srv/special/national/county-plumbing-facilities/index.html
Date Data Obtained: November 2018
Data Type: Website

Source (5) Citation: Pinsent Masons Water Yearbook. (2013).
Variable / Units: Urban population with household sewerage (%); Treatment rate (%); Connection rate (%) (type of data available varies across different cities)
Method: N/A
Year of Publication: 2013
Covered Time: Varies by city; most recent year of available data is used in calculations
URL: http://wateryearbook.pinsentmasons.com/
Date Data Obtained: December 2017

Data Type: Tabular

Source (6) Citation: The International Benchmarking Network for Water and Sanitation Utilities (IBNET). Retrieved from: https://www.ib-net.org/; https://www.ib-net.org/toolkit/ibnet-indicators/quality-of-service/.
Variable / Units: Sewerage Coverage (%), defined as "population with sewerage services (direct service connection)as a percentage of the total population under utility's notional responsibility"; Wastewater – at least primary treatment (%), defined as "proportion of collected sewage that receives at least primary treatment, i.e. involving settlement with the intention of removing solids, but not biological treatment," ; Wastewater primary treatment only (%), defined as "proportion of collected sewage that receives primary treatment only, i.e. involving settlement with the intention of removing solids, but not biological treatment"; and Wastewater secondary treatment or better (%), defined as "Proportion of collected sewage that receives at least secondary treatment, i.e. removing oxygen demand as well as solids, normally biological."
Method: For cities with complete data, sewerage coverage (%) is multiplied by the percent of wastewater treated. The broadest available category of reported wastewater treatment data is used. Some cities only report more specific values - e.g., wastewater primary treated only - in which case, this data is used as a proxy for the percent of wastewater treated if no better data is available.
Year of Publication: 2017
Covered Time: 1989-2016
URL: https://www.ib-net.org/; https://www.ib-net.org/toolkit/ibnet-indicators/quality-of-service/
Date Data Obtained: December 2017
Data Type: Tabular

Source (7) Citation: Organisation for Economic Cooperation and Development (OECD). Environment Database - Total public sewerage (% of resident population connected to urban wastewater collecting system). Retrieved from: https://stats.oecd.org/.
Variable / Units: Total public sewerage (% of resident population connected to urban wastewater collecting system)
Method: N/A
Year of Publication: 1990 - 2016 (data availability varies by city; year of most recent data available used in calculations)
Covered Time:
URL: https://stats.oecd.org/
Date Data Obtained: November 2018
Data Type: Tabular

Source (8) Citation: Narain, S., & Pandey, P. (2012). Excreta Matters: How urban India is soaking up water, polluting rivers and drowning in its own waste. Centre for Science and Environment.
Variable / Units: Sewage generated (MLD); Population covered by sewerage network (%); Actual sewage treated (MLD)
Method: We calculate the ratio of actual sewage treated divided by sewage generated for Delhi. *The Excreta Matters report notes different estimates for sewage generated, depending on data source. We follow the report's approach, of using 4456 MLD, but also echo its note that, in 2009, the Central Pollution Control Board (CPCB) revised its estimate to 2984 MLD.
Year of Publication: 2012
Covered Time: 2005-2006
URL: N/A
Date Data Obtained: December 2017
Data Type: Tabular

Source (9) Citation: Beijing Municipal Bureau of Statistics NBS Survey Office in Neijing. Beijing Statistical Yearbook 2017. (p. 19) Retrieved from: http://tjj.beijing.gov.cn/nj/main/2017-tjnj/zk/indexeh.htm.
Variable / Units: Sewage treatment rate (sewage treated/sewage generated for Beijing (%))
Method: N/A
Year of Publication: 2018
Covered Time: 2017
URL: http://tjj.beijing.gov.cn/nj/main/2017-tjnj/zk/indexeh.htm
Date Data Obtained: 2018
Data Type: Website

Source (10) Citation: Japan International Cooperation Agency (JICA). (2012). The Project for Capacity Development of the Wastewater Sector through Reviewing the Wastewater Management Plan in DKI Jakarta in the Republic of Indonesia.
Variable / Units: Households with sewerage coverage (%)
Method: N/A
Year of Publication: 2012
Covered Time: Not specified
URL: http://open_jicareport.jica.go.jp/pdf/12078622_01.pdf

Date Data Obtained: December 2017
Data Type: Tabular

Source (11) Citation: Ciudad de México. (2017). Volume of wastewater in the CDMX: Sewage Water.
Variable / Units: Wastewater generated by the city's population (liters per second; cubic meters/second); wastewater treated (liters per second; cubic meters/second)
Method: Ratio of wastewater treated/wastewater generated
Year of Publication: Not specified (accessed December 2017)
Covered Time: Not specified (accessed December 2017)
URL: http://www.cuidarelagua.cdmx.gob.mx/volumen.html
Date Data Obtained: December 2017
Data Type: Tabular

Source (12) Citation: Tokyo Metropolitan Government. Bureau of Sewerage. Statistics of Sewerage in Tokyo: Total Population and Sewerage Coverage Ratio. Retrieved March 2018 from: http://www.gesui.metro.tokyo.jp/english/aboutus/ourprofile/07/index.html.
Variable / Units: Total Population and Percentage of Sewered Population.
Method: Report percentage of sewered population (relative to total population of Tokyo)
Year of Publication: 2016
Covered Time: 1965-2015; 2015 values reported
URL: http://www.gesui.metro.tokyo.jp/english/aboutus/ourprofile/07/index.html
Date Data Obtained: March 2018
Data Type: Tabular

Source (13) Citation: Sustainable Water Management Division, Environment Canada. (2011). 2011 Municipal Water Use Report – Municipal Water Use 2009 Statistics. Table 3: Residential Sewage Disposal, by Province/Territory and Municipal Population.
Variable / Units: Percent of the population that is served by sewers in municipalities with more than 500,000 residents
Method: N/A
Year of Publication: 2011
Covered Time: 2009
URL: https://ec.gc.ca/doc/publications/eau-water/com1454/survey8-eng.htm
Date Data Obtained: December 2017
Data Type: Tabular

Source (14) Citation: Johannesburg Water. (2016). Integrated Annual Report 2015/2016. Pp. 59. Retrieved from: https://www.johannesburgwater.co.za/wp-content/uploads/2016/03/Annual-Report-2016_17.pdf.
Variable / Units: Compliance of the effluent produced at wastewater treatment works with legislation.
Method: N/A
Year of Publication: 2016
Covered Time: 2015-2016
URL: https://www.johannesburgwater.co.za/wp-content/uploads/2016/03/Annual-Report-2016_17.pdf
Date Data Obtained: December 2017
Data Type: PDF

Source (15) Citation: Environment and Climate Change Canada. (2011). 2011 Municipal Water Use Report – Municipal Water Use 2009 Statistics. Retrieved from: https://ec.gc.ca/doc/publications/eau-water/com1454/survey8-eng.htm.
Variable / Units: Percent of the population that is served by sewers (for municipal populations of over 500,000).
Method: N/A
Year of Publication: 2011
Covered Time: 2009
URL: https://ec.gc.ca/doc/publications/eau-water/com1454/survey8-eng.htm
Date Data Obtained: December 2017
Data Type: Website

Indicator: Proximity to Public Transit (PPT)

Code: PUBTRANS

Objective / Issue Category: Sustainable Public Transportation

What it Measures: The percentage of population living within walking distance to a transit stop.

Rationale for Inclusion: Public transportation poses potential benefits to fuel efficiency compared with other modes of transportation. Along with sound land use controls encouraging density near transit stops, public transit access contributes to sustainable urban form.

INDICATOR CREATION

Unit of Measurement: distance in meters (m)
Method / Description: Using OpenStreetMap data, identify locations of transportation access, buffer these points and calculate the percentage of the neighborhood within the buffers.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark (raw data): 1.2 km Low Performance Benchmark (raw data): 95th percentile (2,350 m)
Target Source: While most urban planning literature cites a "catchment zone" (i.e., a geographic area encompassing all possible riders for a mode of public transit) of 0.25 to 0.5 miles (0.4 to 0.8 km), Durand et al. (2016) found in a survey that riders express willingness to travel further. We therefore adopted a target of 1.2 km.
Target Citation: Durand, C. P., Tang, X., Gabriel, K. P., Sener, I. N., Oluyomi, A. O., Knell, G., & Kohl III, H. W. (2016). The association of trip distance with walking to reach public transit: data from the California household travel survey. Journal of transport & health, 3(2), 154-160.

DATA SOURCE(S)

Source (1) Citation: OpenStreetMap contributors. (2018) Planet dump [Data file from August 28, 2018]. Retrieved from https://planet.openstreetmap.org.
Variable / Units: N/A
Method: API
Year of Publication: 2018
Covered Time: 2015
URL: https://www.openstreetmap.org/#map=4/38.01/-95.84
Date Data Obtained: 8/28/2018
Data Type: Geospatial

Indicator: Public Transit - Transportation Coverage (PCT)

Code: TRANSCOV

Objective / Issue Category: Sustainable Public Transportation

What it Measures: The percentage of population living within walking distance to a transit stop.

Rationale for Inclusion: Public transportation poses potential benefits to fuel efficiency compared with other modes of transportation. Along with sound land use controls encouraging density near transit stops, public transit access contributes to sustainable urban form.

INDICATOR CREATION

Unit of Measurement: Percentage of population in a neighborhood with access to public transportation.
Method / Description: Using OpenStreetMap data, identify locations of transportation access, buffer these points and calculate the percentage of the neighborhood within the buffers.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark (raw data): 50th percentile (80 percent) Low Performance Benchmark (raw data): 5th percentile (4 percent)
Target Source: Expert evaluation
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: OpenStreetMap contributors. (2018) Planet dump [Data file from August 28, 2018]. Retrieved from https://planet.openstreetmap.org.
Variable / Units: N/A
Method: API
Year of Publication: 2018
Covered Time: 2015
URL: https://www.openstreetmap.org/#map=4/38.01/-95.84
Date Data Obtained: 8/28/2018
Data Type: Geospatial

Indicator: Tree Cover Loss

Code: TREELOSS

Objective / Issue Category: Urban Tree Cover/Green Space

What it Measures: The Tree Cover Loss Indicator measures the loss in forest cover between 2000 and 2016 over 2000 forest extent. It factors in areas of forest loss across a range of causes including anthropogenic deforestation, natural and anthropogenic forest fires, clearing trees for agriculture, logging, plantation harvesting, and tree mortality due to natural causes.

Rationale for Inclusion: Reduction in the extent of urban tree cover has significant negative implications for ecosystem services and habitat protection.

INDICATOR CREATION

Unit of Measurement: Percentage - Tree cover loss plus tree cover gain, as compared to 2000 levels (unitless)
Method / Description: Hansen et al. (2013) used 650,000 Landsat 7, 30-meter resolution satellite images to quantify the area of forest loss. As defined in Hansen et al. (2013), trees were defined as all vegetation taller than 5m in height. Forest loss was defined as a standard-replacement disturbance or the complete removal of tree cover canopy at the Landsat pixel scale.
Additional Notes: According to Hansen et al. (2013), there are discrepancies between the FAO Forest Resources Assessment country statistics when compared to the satellite-derived estimates. These discrepancies are due to: (i) inconsistent methods between countries; (ii) defining "forest" based on land use instead of land cover, thereby obscuring the biophysical reality of whether tree cover is present; (iii) forest area changes reported only as net values; and (iv) forest definitions used in successive reports have changed over time.
Transformation Needed for Aggregation: TBD
Target: High Performance Benchmark: 0 Low Performance Benchmark: 95th percentile (14.53 percent)
Target Source: Expert opinion, lack of globally agreed upon targets for urban tree cover loss
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013.

"Hansen/UMD/Google/USGS/NASA Tree Cover Loss and Gain Area." University of Maryland, Google, USGS, and NASA. Accessed through Global Forest Watch in August 2015. www.globalforestwatch.org.
Variable / Units: Tree cover loss plus gain as compared to 2000 levels
Method: Hansen et al. (2013) used 650,000 Landsat 7, 30-meter resolution satellite images to quantify the area of forest loss. As defined in Hansen et al. (2013), trees were defined as all vegetation taller than 5m in height. Forest loss was defined as a stand-replacement disturbance or the complete removal of tree cover canopy at the Landsat pixel scale. Results were disaggregated by reference percent tree cover stratum (e.g. >30% crown cover to ~0% crown cover) and by year.
Year of Publication: 2015
Covered Time: 2000-2016
URL: http://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.2.html
Date Data Obtained: 8/20/17
Data Type: Tabular

Indicator: Tree Cover per Capita

Code: TREECAP

Objective / Issue Category: Urban Tree Cover/Green Space

What it Measures: The Tree Cover Extent indicator measures how much tree cover is available in an urban neighborhood in sq. kilometers.

Rationale for Inclusion: Tree cover and green space help cool cities and creates habitat that supports biodiversity. Access to green space also enhances the social, physical, and economic health of a community.

INDICATOR CREATION

Unit of Measurement: Tree cover per capita in sq. m per person
Method / Description: Hansen et al. (2013) used 650,000 Landsat 7, 30-meter resolution satellite images to quantify the area of forest loss. As defined in Hansen et al. (2013), trees were defined as all vegetation taller than 5m in height.
Additional Notes: According to Hansen et al. (2013), there are discrepancies between the FAO Forest Resources Assessment country statistics when compared to the satellite-derived estimates. These discrepancies are due to: (i) inconsistent methods between countries; (ii) defining "forest" based on land use instead of land cover, thereby obscuring the biophysical reality of whether tree cover is present; (iii) forest area changes reported only as net values; and (iv) forest definitions used in successive reports have changed over time.
Transformation Needed for Aggregation: N/A
Target: High Performance Benchmark: 15 meters Low Performance Benchmark: 5th percentile (0)
Target Source: UN Habitat City Prosperity Index
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "Hansen/UMD/Google/USGS/NASA Tree Cover Loss and Gain Area." University of Maryland, Google, USGS, and NASA. Accessed through Global Forest Watch in August 2015. www.globalforestwatch.org.
Variable / Units: square meters
Method: Hansen et al. (2013) used 650,000 Landsat 7, 30-meter resolution satellite images to quantify the area of forest loss. As defined in Hansen et al. (2013), trees

were defined as all vegetation taller than 5m in height.
Year of Publication: 2017
Covered Time: 2000-2016
URL: http://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.2.html
Date Data Obtained: 8/20/17
Data Type: Tabular

Indicator: Population reported from Cities

Code: POP

Objective / Issue Category: Equity

What it Measures: Population of cities at neighborhood/district/ward levels

Rationale for Inclusion: Used as an input variable for equity analysis

INDICATOR CREATION

Unit of Measurement: persons Note: separate for population data generated through GRUMP
Method / Description: Import of population data from official and publicly available sources
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: N/A
Target Source: N/A
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: Population by sub-district and age groups 2017. City of Amsterdam Research, Information and Statistics
Variable / Units: Persons
Method: N/A
Year of Publication: 2016
Covered Time: 2016
URL: http://www.ois.amsterdam.nl/download/14a-bevolking-wijken-en-stadsdelen-naar-vijfjaars-leeftijdsgroepen-1-januari-2017.xlsx
Date Data Obtained: 10/10/17
Data Type: Tabular

Source (2) Citation: Bangalore Urban Metabolism Project
Variable / Units: Persons
Method: N/A
Year of Publication: 2011
Covered Time: 2011
URL: http://bangalore.urbanmetabolism.asia/geoportal/#
Date Data Obtained: 9/9/17

Data Type: Tabular

Source (3) Citation: Population by Amphoe. National Statistical Office - 2010 Population and Housing Census
Variable / Units: Persons
Method: N/A
Year of Publication: 2012
Covered Time: 2010
URL: http://web.nso.go.th/en/census/poph/2010/data/bkk_6_Statistical.pdf
Date Data Obtained: August 2017
Data Type: Tabular

Source (4) Citation: Table 3-8 Resident Population (local and non-local). The Beijing Regional Statistical Yearbook 2016.
Variable / Units: Persons
Method: N/A
Year of Publication: 2016
Covered Time: 2015
URL: http://www.bjstats.gov.cn/nj/qxnj/2016/zk/indexce.htm
Date Data Obtained: 12/18/17
Data Type: Tabular

Source (5) Citation: The Borough of Berlins 2014. Statistics for the City of Berlin 2015.
Variable / Units: N/A
Method: N/A
Year of Publication: 2015
Covered Time: 2014
URL: https://www.statistik-berlin-brandenburg.de/produkte/kleinestatistik/AP_KleineStatistik_EN_2015_BE.pdf
Date Data Obtained: August 2017
Data Type: Tabular

Source (6) Citation: Total Population by Commune, Legal Population Of The Regions, Provinces, Prefectures, Municipalities, Arrondissements And Communes Of The Kingdom According To The 2014 RGPH Results (12 Regions)
Variable / Units: Persons

Method: N/A
Year of Publication: 2015
Covered Time: 2014
URL: http://www.hcp.ma/downloads/RGPH-2014_t17441.html
Date Data Obtained: 8/25/17
Data Type: Tabular

Source (7) Citation: Table 02.01 Area, population and population density in 2015 by district. Ho Chi Minh City Statistical Office - 2015 Statistical Survey
Variable / Units: Persons
Method: N/A
Year of Publication: 2016
Covered Time: 2015
URL: http://www.pso.hochiminhcity.gov.vn/web/guest/niengiamthongke-nam2015
Date Data Obtained: 7/24/17
Data Type: Tabular

Source (8) Citation: Table 3.1.7 Population by Subdistrict, Sex, and Sex Ratio, 2015. Jakarta in Figures 2016. BPS-Statistics of DKI Jakarta Province.
Variable / Units: Persons
Method: N/A
Year of Publication: 2016
Covered Time: 2015
URL: https://jakarta.bps.go.id/backend/pdf_publikasi/Jakarta-Dalam-Angka-2016.pdf
Date Data Obtained: August 2017
Data Type: Tabular

Source (9) Citation: Population statistics 2011. Corporate Geo-Informatics Ward census 2011 information. City of Johannesburg.
Variable / Units: Persons
Method: N/A
Year of Publication: 2011
Covered Time: 2011
URL: http://ims.joburg.org.za/joburg/viewer.aspx
Date Data Obtained: 11/28/17
Data Type: Tabular

Source (10) Citation: U.S. Census Bureau, 2016 American Community Survey 1-Year Estimates, Public Use Microdata Sample
Variable / Units: B01003: Total Population
Method: https://www.census.gov/programs-surveys/acs/methodology/design-and-methodology.html
Year of Publication: 2017
Covered Time: 1/2016-12/2016
URL: https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t
Date Data Obtained: December 2016
Data Type: CSV

Source (11) Citation: London Borough Profiles, London Datastore, Greater London Authority
Variable / Units: Persons
Method: N/A
Year of Publication: 2017
Covered Time: 2016
URL: https://data.london.gov.uk/dataset/london-borough-profiles
Date Data Obtained: 12/18/17
Data Type: Tabular

Source (12) Citation: Summary Table A. Population And Annual Growth Rates For The Philippines And Its Regions, Provinces, and Highly Urbanized Cities
Variable / Units: Persons
Method: N/A
Year of Publication: 2016
Covered Time: 2015
URL: https://www.psa.gov.ph/content/highlights-philippine-population-2015-census-population
Date Data Obtained: 7/24/17
Data Type: Tabular

Source (13) Citation: Population, Intercensal Survey 2015. Instituto Nacional de Estadística y Geografía.
Variable / Units: Persons
Method: N/A
Year of Publication: 2016
Covered Time: 2015
URL: http://www.beta.inegi.org.mx/contenidos/Proyectos/enchogares/especiales/intercensal/2015/tabulados/01_poblacion_cdmx.xls
Date Data Obtained: 8/17/17
Data Type: Tabular

Source (14) Citation: Census of India 2011 Primary Census Abstract Data Highlights Districts and Sub-Districts NCT of Delhi
Variable / Units: Persons
Method: N/A
Year of Publication: 2013
Covered Time: 2011
URL: http://www.censusindia.gov.in/2011census/PCA/PCA_Highlights/pca_highlights_file/Delhi/DATA_SHEET_PCA_SUB-DISTRICTS_NCT_OF_DELHI.pdf
Date Data Obtained: 7/31/17
Data Type: Tabular

Source (15) Citation: U.S. Census Bureau, 2016 American Community Survey 1-Year Estimates, Public Use Microdata Sample
Variable / Units: B01003: Total Population
Method: https://www.census.gov/programs-surveys/acs/methodology/design-and-methodology.html
Year of Publication: 2017
Covered Time: 1/2016-12/2016
URL: https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t
Date Data Obtained: December 2017
Data Type: CSV

Source (16) Citation: Population of Paris by Arrondissement. L'Institut national de la statistique et des études économiques (Insee).
Variable / Units: Persons
Method: N/A
Year of Publication: 2014
Covered Time: 2014
URL: https://www.insee.fr/fr/statistiques/1405599?geo=COM-75120
Date Data Obtained: 8/31/17
Data Type: Tabular

Source (17) Citation: Tabnet - Prefeitura de Sao Paulo. População Residente Segundo Sexo, Faixa Etária, Raça / Cor E Local De Residência. Município De São Paulo. Censo demográfico (IBGE), 2010.
Variable / Units: Persons
Method: N/A
Year of Publication: 2010
Covered Time: 2010
URL: http://tabnet.saude.prefeitura.sp.gov.br/cgi/deftohtm3.exe?secretarias/saude/TABNET/POPRC/poprc.def
Date Data Obtained: 7/27/17
Data Type: Tabular

Source (18) Citation: Resident population in the second quarter of 2017 (Table 1 - Registered Population). Seoul Metropolitan Government Open Data Portal.
Variable / Units: Persons
Method: N/A
Year of Publication: 2017
Covered Time: 2017
URL: http://data.seoul.go.kr/together/statbook/statbookList.do
Date Data Obtained: 9/8/17
Data Type: Tabular

Source (19) Citation: Table 7 Resident Population by Planning Area/Subzone, Age Group and Sex. Singapore Department of Statistics - General Household Survey 2015
Variable / Units: Persons
Method: N/A
Year of Publication: 2017
Covered Time: 2015
URL: http://www.singstat.gov.sg/statistics/browse-by-theme/geographic-distribution
Date Data Obtained: 9/8/17
Data Type: Tabular

Source (20) Citation: 2-3 Population by District. Tokyo Statistical Yearbook 2015
Variable / Units: Persons
Method: N/A
Year of Publication: 2015
Covered Time: 2015
URL: http://www.toukei.metro.tokyo.jp/tnenkan/2015/tn15q3e002.htm
Date Data Obtained: 8/2/17
Data Type: Tabular

Source (21) Citation: City of Vancouver Local Area Profile Census 2011. City of Vancouver
Variable / Units: Persons
Method: N/A
Year of Publication: 2015
Covered Time: 2011

URL: ftp://webftp.vancouver.ca/opendata/xls/CensusLocalAreaProfiles2011.xls
Date Data Obtained: 10/4/17
Data Type: Tabular

Source (22) Citation: 2016 Census, Statistics Canada
Variable / Units: Persons
Method: N/A
Year of Publication: 2016
Covered Time: 2016
URL: http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng.cfm
Date Data Obtained: 2/4/18
Data Type: Tabular

Source (23) Citation: Distribució Territorial de la Renda Familiar Disponible per càpita a Barcelona
Variable / Units: Persons
Method: Persons
Year of Publication: 2017
Covered Time: 2016
URL: http://www.bcn.cat/estadistica/castella/dades/barris/economia/renda/rdfamiliar/a2016.htm
Date Data Obtained: 13/02/2018
Data Type: Tabular

Source (24) Citation: Population and People, Australia, State and Territory, Statistical Area Levels 2-4, Greater Capital City Statistical Area, 2011-2016, Data by Region, 2011-2016, Australian Bureau of Statistics
Variable / Units: Total persons
Method: N/A
Year of Publication: 2017
Covered Time: 2011-2016
URL: http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/1410.0Explanatory%20Notes12011-16
Date Data Obtained: 28/02/2018
Data Type: Tabular

Source (25) Citation: Tab_Be4_1_2_Tidsserie: Københavns befolkning 1992-20171231 på distrikter, Statistikbanken
Variable / Units: Persons by district
Method: N/A
Year of Publication: 2017
Covered Time: 2015
URL: http://sgv2.kk.dk:9704/analytics/saw.dll?PortalPages&PortalPath=%2fshared%2fStatistik%20Rapporter%2f_portal%2fBefolkning&Page=Tab_Be4_1_2_Tidsserie&Done=PortalPages%26PortalPath%3d%252fshared%252fStatistik%2520Rapporter%252f_portal%252fBefolkning%26Page%3dTab_Be4_tidsserie_menu%26ViewState%3df9cg601f7bl8qlmp80g0cfqdjm
Date Data Obtained: 28/08/2018
Data Type: Tabular

Source (26) Citation: Center for International Earth Science Information Network - CIESIN - Columbia University. 2017. Gridded Population of the World, Version 4 (GPWv4): Population Density, Revision 10. Pal1isades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/H4DZ068D. Accessed 12/8/2017
Variable / Units: human population density (number of persons per square kilometer)
Method: N/A
Year of Publication: 2017
Covered Time: 2000, 2005, 2010, 2015, 2020 (2015 data used in UESI)
URL: https://doi.org/10.7927/H4DZ068D
Date Data Obtained: 12/8/17
Data Type: Geospatial

Source (27) Citation: Buenos Aires City Statistics
Variable / Units: persons by comunas
Method: census
Year of Publication: 2018
Covered Time: 2016
URL: http://www.estadisticaciudad.gob.ar/eyc/?p=85555
Date Data Obtained: 12/8/2017
Data Type: Tabular

Indicator: Mean income per capita or per household by neighborhood

Code: INCOME

Objective / Issue Category: Equity

What it Measures: Income per capita/per household by neighborhood in each city

Rationale for Inclusion: Used as an input variable for equity calculations

INDICATOR CREATION

Unit of Measurement: local currencies
Method / Description: Mean income values are adopted from census data where applicable. In cities where only income brackets are available, mean income is calculated from income brackets. In cities where mean income is unavailable, median income is used. The income data is then standardized to 2016 US dollar values, adjusting for inflation.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: N/A
Target Source: N/A
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: 3.15 Kerncijfers inkomen, 2014. City of Amsterdam Research, Information and Statistics.
Variable / Units: Average annual personal income/euros
Method: N/A
Year of Publication: 2017
Covered Time: 2014
URL: https://www.ois.amsterdam.nl/feiten-en-cijfers/#
Date Data Obtained: 10/10/17
Data Type: Tabular

Source (2) Citation: Bangkok Metropolitan Administration 2016 Statistical Profile
Variable / Units: Average monthly personal income/baht
Method: N/A
Year of Publication: 2016
Covered Time: 2009
URL: http://www.fpo.go.th:81/StatisticData/table3.php

Date Data Obtained: 10/14/17
Data Type: Tabular

Source (3) Citation: Table 2-14 Average Urban Individual Disposable Income. The Beijing Regional Statistical Yearbook 2016.
Variable / Units: Average yearly personal income/yuan
Method: N/A
Year of Publication: 2016
Covered Time: 2015
URL: http://www.bjstats.gov.cn/nj/qxnj/2016/zk/indexch.htm
Date Data Obtained: 12/18/17
Data Type: Tabular

Source (4) Citation: The Borough of Berlins 2014. Statistics for the City of Berlin 2015.
Variable / Units: Monthly mean net household income/euros
Method: N/A
Year of Publication: 2015
Covered Time: 2014
URL: https://www.statistik-berlin-brandenburg.de/pms/2013/13-08-08c.pdf
Date Data Obtained: August 2017
Data Type: Tabular

Source (5) Citation: INDO-DAPOER, World Bank Group
Variable / Units: Household per capita expenditure/Indonesian Rupiahs
Method: Expenditure is used as a proxy for income data. Neighborhoods in Jakarta are assumed to have uniform income as the administrative city (kota administrasi) to which they belong, at which income data is available. Raw expenditure data is multiplied by 12 to derive annual per capital expenditure, and the income data is disaggregated to smaller neighbourhood units
Year of Publication: N/A
Covered Time: 2014
URL: https://datacatalog.worldbank.org/dataset/indonesia-database-policy-and-economic-research
Date Data Obtained: 12/26/17
Data Type: Tabular

Source (6) Citation: Income statistics 2011. Corporate Geo-Informatics Ward census 2011 information. City of Johannesburg.
Variable / Units: No. of people in 12 income brackets
Method: N/A
Year of Publication: 2011
Covered Time: 2011
URL: http://ims.joburg.org.za/
Date Data Obtained: 11/28/17
Data Type: Tabular

Source (7) Citation: Income and tax by borough and district or unitary authority: 2013 to 2014. HM Revenue & Customs.
Variable / Units: Yearly personal income/pound sterling
Method: N/A
Year of Publication: 2017
Covered Time: 2013 to 2014
URL: https://www.gov.uk/government/statistics/income-and-tax-by-county-and-region-2010-to-2011
Date Data Obtained: 7/27/17
Data Type: Tabular

Source (8) Citation: U.S. Census Bureau, 2016 American Community Survey 1-Year Estimates, Public Use Microdata Sample
Variable / Units: S1903, Median Income in the past 12 Months (in 2016 Inflation-adjusted dollars)
Method: https://www.census.gov/programs-surveys/acs/methodology/design-and-methodology.html
Year of Publication: 2017
Covered Time: 1/2016-12/2016
URL: https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t
Date Data Obtained: December 2017
Data Type: CSV

Source (9) Citation: City of Buenos Aires. (2017). Average Household Income. General Directorate of Statistics and Census.
Variable / Units: USD
Method: N/A
Year of Publication: 2017
Covered Time: 2017
URL: http://www.estadisticaciudad.gob.ar/eyc/?p=82453
Date Data Obtained: 10/31/18
Data Type: Tabular

Source (10) Citation: Income (Including Government Allowances), Education and Employment, Health and Disability, Australia, State and Territory, Statistical Area Levels 2-4, Greater Capital City Statistical Area, 2011-2016, Australia Bureau of Statistics
Variable / Units: Mean Total income (excl. Government pensions)
Method: N/A
Year of Publication: 2017
Covered Time: 2011-2016
URL: http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/1410.0Explanatory%20Notes12011-16
Date Data Obtained: 28/02/2017
Data Type: Tabular

Source (11) Citation: Distribució Territorial de la Renda Familiar Disponible per càpita a Barcelona
Variable / Units: Índice RFD (Barcelona = 100)
Method: Barcelona's RFD (Family income available per capita) is normalized at 100 and the neighborhoods' values are benchmarked against it
Year of Publication: 2017
Covered Time: 2016
URL: http://www.bcn.cat/estadistica/castella/dades/barris/economia/renda/rdfamiliar/a2016.htm
Date Data Obtained: 13/02/2018
Data Type: Tabular

Source (12) Citation: Gross disposable family income of Barcelona and Catalonia. 2011-2014. Base 2010
Variable / Units: EUR
Method: N/A
Year of Publication: 2017
Covered Time: 2010-2014
URL: http://www.bcn.cat/estadistica/angles/dades/anuari/cap14/C1401010.htm
Date Data Obtained: 2/4/18
Data Type: Tabular

Source (13) Citation: Table A. Standard Error, Coefficient of Variation and Estimates of Average Income by Region and Province. Family Income and Expenditure Survey. Philippine Statistics Authority
Variable / Units: Average yearly household income/Philippine pesos
Method: N/A
Year of Publication: 2016
Covered Time: 2012
URL: https://psa.gov.ph/content/2012-annual-average-income-and-expenditure-region-and-province
Date Data Obtained: 8/23/17
Data Type: Tabular

Source (14) Citation: Población Ocupada en la Ciudad de México por Delegación, según nivel de Ingresos Tercer trimestre 2017. INEGI. Encuesta Nacional de Ocupación y Empleo (ENOE).
Variable / Units: Number of people who earn up to a minimum wage; more than 1 to 2 minimum wages; more than 2 to 3 minimum wages; more than 3 to 5 minimum wages; more than 5 minimum wages and who do not receive income and / or is not specified/Mexican pesos
Method: N/A
Year of Publication: 2017
Covered Time: Third quarter 2017
URL: http://reporteeconomico.sedecodf.gob.mx/index.php/site/main/114
Date Data Obtained: 12/7/17
Data Type: Tabular

Source (15) Citation: U.S. Census Bureau, 2016 American Community Survey 1-Year Estimates, Public Use Microdata Sample
Variable / Units: S1903, Median Income in the past 12 Months (in 2016 Inflation-adjusted dollars)
Method: https://www.census.gov/programs-surveys/acs/methodology/design-and-methodology.html
Year of Publication: 2017
Covered Time: 1/2016-12/2016
URL: https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t
Date Data Obtained: December 2017
Data Type: CSV

Source (16) Citation: Territor comparator. Institut national de la statistique et des etudes economiques (INSEE).
Variable / Units: Median disposable income per consumption unit in 2014/euros
Method: N/A
Year of Publication: 2014
Covered Time: 2014
URL: https://www.insee.fr/fr/statistiques/1405599?geo=COM-75120
Date Data Obtained: 12/19/17
Data Type: Tabular

Source (17) Citation: Censo demográfico : 2010 : características da população e dos domicílios : resultados do universo. Instituto Brasileiro de Geografia e Estatística.
Variable / Units: Number of people by income level base in Brasilian minimum wage 510 BRL: less than 1/4; between 1/4 and 1/2; between 1/2 and 1; between 1 and 2; between 2 and 3; between 3 and 5; and greater than 5 minimum wages/Brazilian Reals
Method: N/A
Year of Publication: 2011
Covered Time: 2010
URL: biblioteca.ibge.gov.br/pt/biblioteca-catalogo?view=detalhes&id=793
Date Data Obtained: 7/27/17
Data Type: Tabular

Source (18) Citation: Seoul Institute, Seoul Survey 2016.
Variable / Units: Average household monthly income in won
Method: N/A
Year of Publication: 2017
Covered Time: 2016
URL: N/A
Date Data Obtained: 12/29/17
Data Type: PDF

Source (19) Citation:
Resident Working Persons Aged 15 Years and Over by Planning Area and Gross Monthly Income from Work. General Household Survey 2015. Singapore Department of Statistics.
Variable / Units: Number of people in 15 different income brackets/Singapore dollars
Method: N/A
Year of Publication: 2017
Covered Time: 2015
URL: http://www.singstat.gov.sg/docs/default-source/default-document-library/publications/publications_and_papers/GHS/ghs2015/excel/t143-147.xls
Date Data Obtained: 10/4/17
Data Type: Tabular

Source (20) Citation: Ordinary Households, Persons per Household, Dwelling Rooms per Household and Tatami Units of Dwelling Rooms per Household by Annual Income (9 Groups), Type of Household (2 Groups) and Tenure of Dwelling (5 Groups) - Shi, Ku, Machi and Mura. Housing and Land Statistics Survey Heisei Year 25 (2013). Statistics Bureau of the Ministry of Internal Affairs and Communications, Japan.
Variable / Units: Number of people in 9 different income brackets/Japanese yen
Method: N/A
Year of Publication: 2015
Covered Time: 2013
URL: http://www.e-stat.go.jp/SG1/estat/GL02020101.do?method=xlsDownload&fileId=000007254783&releaseCount=1
Date Data Obtained: 10/4/17
Data Type: Tabular

Source (21) Citation: 2011 National Household Survey. Statistics Canada.
Variable / Units: Median total individual income in 2016 by census tract (before income tax) for individuals aged 15 and over/Canadian dollars
Method: N/A
Year of Publication: 2017
Covered Time: 2016
URL: http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/dt-td/Rp-eng.cfm?LANG=E&APATH=3&DETAIL=0&DIM=0&FL=A&FREE=0&GC=0&GID=0&GK=0&GRP=1&PID=110262&PRID=10&PTYPE=109445&S=0&SHOWALL=0&SUB=0&Temporal=2016&THEME=119&VID=0&VNAMEE=&VNAMEF=
Date Data Obtained: 10/4/17
Data Type: Tabular

Source (22) Citation: 2016 Census. Statistics Canada.
Variable / Units: Median total income in 2015 among recipients ($)
Method: N/A
Year of Publication: 2017
Covered Time: 2016
URL: http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng.cfm
Date Data Obtained: 10/4/17
Data Type: Tabular

Source (23) Citation: U.S. Census Bureau. 2012-2016 American Community Survey (ACS) 5-year estimates.
Variable / Units: B19326e1 Median Income In The Past 12 Months (In 2016 Inflation-Adjusted Dollars) By Sex By Work Experience In The Past 12 Months For The Population 15 Years And Over With Income.
Method: N/A
Year of Publication: 2017
Covered Time: 2012-2016
URL: https://www.census.gov/geo/maps-data/data/tiger-data.html
Date Data Obtained: March 2018
Data Type: Geodatabase

Source (24) Citation: U.S. Census Bureau. 2012-2016 American Community Survey (ACS) 5-year estimates.
Variable / Units: B19326e1 Median Income In The Past 12 Months (In 2016 Inflation-Adjusted Dollars) By Sex By Work Experience In The Past 12 Months For The Population 15 Years And Over With Income.

Method: N/A
Year of Publication: 2017
Covered Time: 2012-2016
URL: https://www.census.gov/geo/maps-data/data/tiger-data.html
Date Data Obtained: March 2018
Data Type: Geodatabase

Source (25) Citation: Detaljeret kort: Så meget tjener københavnerne i dit nabolag
Variable / Units: Average income before tax
Method: (In Danish) Indkomstkortet er delt op i ti grupper: fra de rigeste 10 procent danskere til de 10 procent danskere, der tjener mindst. En mørkeblå firkant betyder, at området har mange københavnere, der hører til blandt landets 10 pct. danskere,der tjener mest. De 826.883 kr er gennemsnitsindkomsten før skat for de ti procent bedst indtjenende danskere opgjort på husstandsniveau på baggrund af den person i husstanden med den højeste indkomst. Al indkomst tæller med: A-indkomst, sociale ydelser, aktieafkast etc.
Year of Publication: 2016
Covered Time: 2014
URL: https://www.b.dk/nationalt/detaljeret-kort-saa-meget-tjener-koebenhavnerne-i-dit-nabolag
Date Data Obtained: 28/02/2018
Data Type: Tabular

Source (26) Citation: U.S. Census Bureau. 2012-2016 American Community Survey (ACS) 5-year estimates.
Variable / Units: B19326e1 Median Income In The Past 12 Months (In 2016 Inflation-Adjusted Dollars) By Sex By Work Experience In The Past 12 Months For The Population 15 Years And Over With Income.
Method: N/A
Year of Publication: 2017
Covered Time: 2012-2016
URL: https://www.census.gov/geo/maps-data/data/tiger-data.html
Date Data Obtained: March 2018
Data Type: Geodatabase

Source (27) Citation: U.S. Census Bureau. 2012-2016 American Community Survey (ACS) 5-year estimates.
Variable / Units: B19326e1 Median Income In The Past 12 Months (In 2016 Inflation-Adjusted Dollars) By Sex By Work Experience In The Past 12 Months For The Population 15 Years And Over With Income.

Method: N/A
Year of Publication: 2017
Covered Time: 2012-2016
URL: https://www.census.gov/geo/maps-data/data/tiger-data.html
Date Data Obtained: March 2018
Data Type: Geodatabase

Indicator: Satellite-derived physical characteristics of cities

Code: NDVI, NDBI, ALBEDO, ELEVATION

Objective / Issue Category: Overall

What it Measures: NDVI (Normalized Difference Vegetation Index) is a proxy for the green vegetation on the surface NDBI (Normalized DIfference Built-up Index) is a proxy for built-up surfaces ALBEDO is the reflectivity of solar radiation from the surface ELEVATION is the height of the terrain.

Rationale for Inclusion: The physical characteristics of the city may mitigate or exacerbate the environmental performance.

INDICATOR CREATION

Unit of Measurement: Unitless for NDVI, NDBI, and ALBEDO. ELEVATION is in meters
Method / Description: These datasets are based on satellite measurements. The albedo is the broadband shortwave black-sky albedo, which is the reflectivity of the surface to direct beam shortwave radiation, derived from the MODIS MCD43B3.005 16-day satellite products available at 1 km x 1 km resolution (Wanner et al. 1997). The NDVI and NDBI are measures of surface greenness and built-up index, respectively, and are derived from landsat 7 data available at 30 m x 30 m resolution. Finally, the elevation is from the Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010) dataset at 7.5 arc seconds (Danielson et al. 2011). To keep all the datasets consistent with the elevation data, which is only available for 2010, the other physical characteristics were also calculated for 2010.
Additional Notes: N/A
Transformation Needed for Aggregation: N/A
Target: N/A
Target Source: N/A
Target Citation: N/A

DATA SOURCE(S)

Source (1) Citation: N/A
Variable / Units: N/A
Method: N/A
Year of Publication: N/A
Covered Time: N/A
URL: N/A
Date Data Obtained: N/A
Data Type: N/A